

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing

(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2009/001572

International filing date (day/month/year)
11.03.2009

Priority date (day/month/year)
19.03.2008

International Patent Classification (IPC) or both national classification and IPC
INV. H01L33/00

Applicant
CREE, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of
this opinion

see form
PCT/ISA/210

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2009/001572

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2009/001572

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>3-7,10,13,16,17,20,22-31,34-40</u>
	No: Claims	<u>1,2,8,9,11,12,14,15,18,19,21,32,33</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-40</u>
Industrial applicability (IA)	Yes: Claims	<u>1-40</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Concerning Section V:

I. Claims 1 to 20:

1. The document US-A-2007/0012940, which will be referred to as D1 in the following procedure, describes (cf. paragraphs [0007], [0008], [0031] to [0064], and Figs 3 to 6) a light emitting diode (LED) device, which comprises an LED chip (35; 45; 55; 65) disposed on a mount surface, said LED chip having a textured light emission surface and a first index of refraction, a spacer layer (36; 46; 56; 66) disposed on said LED chip and covering said light emission surface, said spacer layer having a second index of refraction that is smaller than said first index of refraction, and at least one functional layer (39; 49; 59; 69) disposed on said spacer layer.
2. As a consequence, all the features of claim 1 are anticipated by document D1. Claim 1 is therefore not considered to meet the requirements of Article 33(2) and (3) PCT.
3. The additional features of claim 2 is known from document D1 as well. Claim 2 is therefore not considered to meet the requirements of Article 33(2) and (3) PCT either.
4. Document D1 describes also a binder material (37; 47; 57; 67) having a third index of refraction that is larger than said second index of refraction, and a plurality of phosphor particles (39; 49; 59; 69) distributed in a further layer behind the binder material. The subject-matter of claim 3 differs therefrom in that the phosphor particles are distributed within the binder layer.

The person skilled in the art knows from document D1 that a layer having a higher index of refraction has to be formed on the spacer layer, and he wants to incorporate a phosphor to convert the radiation of the LED. It then depends on the material he intends to use whether he would incorporate the phosphor particles in the binder layer having the high index of refraction or in a separate layer thereon. In any case the skilled person being informed about the material properties in general would decide about the specific arrangement without employment of inventive skill.

Claim 3 is therefore not considered to meet the requirement of Article 33(3) PCT.

5. The additional features of claim 4 are known from document D1 as well. Claim 4 is therefore not considered to meet the requirement of Article 33(3) PCT either.
6. The additional features of claims 5, 6, 13, 16, and 20 fall into the competence of an average practitioner familiar with the properties of suitable phosphors. Claims 5, 6, 13, 16, and 20 are therefore not considered to meet the requirement of Article 33(3) PCT.
7. The document DE-A-10 2005 062 514, which will be referred to as D2 in the following procedure, describes (cf. paragraphs [0052] to [0069] and Figs 1 to 3) a filter layer (8) that is transmissive to light of a first range of wavelengths and reflective to light of a second range of wavelengths. The purpose of the filter layer is to reflect the converted yellow light, while the emitted blue light should pass. Since the yellow light is generated in the wavelength conversion layer, there is no reason to have the yellow light transverse the spacer layer before it is reflected, and therefore the person skilled in the art would routinely provide the filter layer between the wavelength conversion layer and the spacer layer in a light emitting device according to document D1 without employing inventive skill.

As a consequence, claim 7 is not considered to meet the requirement of Article 33(3) PCT.

8. The additional features of claims 8, 9, 11, 12, 14, and 15 are also known from document D1, because the high index layer (37; 47; 57; 67) has a roughened surface and is thus a scattering element. Claims 8, 9, 11, 12, 14, and 15 are therefore not considered to meet the requirements of Article 33(2) and (3) PCT.
9. The additional feature of claim 10 is an alternative to the roughened surface, which is generally known to the skilled person and which he would choose when appropriate. Claim 10 does therefore not appear to meet the requirement of Article 33(3) PCT.
10. The person skilled in the art of light emitting devices knows that blue light is generally generated on the basis of GaN composite materials, to which AlGaInN belongs. The material is also explicitly mentioned in document D2 (cf. paragraph [0013]).

11. The material of the spacer layer specified in document D1 is generally used for encapsulating light emitting diode chips and therefore must also have the properties of claims 18 and 19. Claims 18 and 19 are therefore not considered to meet the requirements of Article 33(2) and (3) PCT.

II. Claims 21 to 32:

1. Document D1 describes also a light emitting diode (LED) device, which comprises an LED chip (35; 45; 55; 65) disposed on a mount surface and having a textured light emission surface and a first index of refraction, said LED chip (35; 45; 55; 65) emitting blue light, a spacer layer (36; 46; 56; 66) disposed on said LED chip and covering said light emission surface, said spacer layer having a planar surface opposite said LED chip and a second index of refraction that is smaller than said first index of refraction, a wavelength conversion layer (39; 49; 59; 69) disposed on said spacer layer, said wavelength conversion layer converting a portion of said blue light and emitting yellow light, and an encapsulant disposed on said mount surface and covering said LED chip, wherein said light emitting diode device is constructed to emit a combination of said blue and yellow light such that said combination appears white.
2. As a consequence, all the features of claim 21 are anticipated by document D1, and therefore claim 21 does not appear to meet the requirements of Article 33(2) and (3) PCT.
3. The additional feature of claim 22 is known from document D2, as has been set out in paragraph I.7 above. Claim 22 is thus not considered to meet the requirement of Article 33(3) PCT.
4. Claim 23 differs from claim 3 in that the binder material is a silicone binder material. Silicone is generally known in the art and also mentioned in document D1. Claim 23 is not considered to meet the requirement of Article 33(3) PCT for the reasons set out in paragraph I.4 above.
5. The additional features of claims 24 to 26 are generally known and their presence does not involve an inventive step. Claims 24 to 26 are therefore not considered to meet the requirement of Article 33(3) PCT.

6. The additional features of claims 27 to 31 fall into the competence of an average practitioner, so that claims 27 to 31 do not appear to meet the requirement of Article 33(3) PCT either.
7. As has been pointed out in paragraph I.11 above, the material specified in document D1 must have the property specified in claim 32. Claim 32 is therefore not considered to meet the requirements of Article 33(2) and (3) PCT.

III. Claims 33 to 40:

1. Document D1 describes also a method of fabricating a light emitting diode (LED) device, which comprises the steps of providing an LED chip (35; 45; 55; 65) having a first index of refraction and a textured light emission surface, disposing a spacer layer (36; 46; 56; 66) with a second index of refraction on said LED chip, wherein said second index of refraction that is smaller than said first index of refraction, disposing a functional layer (39; 49; 59; 69) with a third index of refraction on said spacer layer, wherein said second index of refraction is smaller than said third index of refraction, and said second index of refraction is chosen to maximize light extraction efficiency.
2. As a consequence, all the features of claim 33 are anticipated by document D1, and therefore claim 33 is not considered to meet the requirements of Article 33(2) and (3) PCT.
3. The additional feature of claim 34 is known from document D1 as well. Therefore claim 34 is not considered to meet the requirement of Article 33(2) and (3) PCT.
4. The additional features of claims 35 to 40 fall into the competence of an average practitioner. Claims 35 to 40 are therefore not considered to meet the requirement of Article 33(3) PCT.

Concerning Section VII:

1. Independent claims 1, 21, and 33 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.

Concerning Section VIII:

1. Claim 33 does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter in terms of the result to be achieved ("... said second index of refraction is chosen to maximize light extraction efficiency."), which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.
2. Although claims 1 and 21 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	<p>For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.</p>
Amending claims under Art. 19 PCT	<p>Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.</p>
Filing a demand for international preliminary examination	<p>In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT).</p> <p>If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).</p>
Filing informal comments	<p>After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.</p>
End of the international phase	<p>At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).</p>
Relevant PCT Rules and more information	<p>Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003</p>